Memorandum

To: Cora Panturad, Sustainable Infrastructure Analyst, County of Monterey

From: Curtis Schmitt, P.E., Principal, ARC Alternatives

Date: January 9, 2024

Re: Review of Natividad Medical Center OBF Lighting Project

Background

The County of Monterey (County) is considering a lighting retrofit at Natividad Medical Center (NMC) with EcoGreen, and it is proposed to be funded under PG&E's On-bill Financing (OBF). The proposed cost of the project is $999,161.23 and is projected to save 1,041,654 kilowatt-hours per year. The project as proposed saves $172,939 annually yielding a 5.78 year simple payback. EcoGreen has completed a detailed audit and obtained an OBF loan agreement, as defined in multiple documents provided to ARC Alternatives from the County, with additional supporting documents provided by EcoGreen during the course of this review. The County has asked ARC Alternatives (ARC) to review the proposed project as an independent party to evaluate the proposed lighting project to confirm the scope of the project is appropriate, and to validate the projected costs and savings are reasonable and accurate. This memorandum documents our review of EcoGreen's proposed project.

Overall Results

Overall, the proposed project and associated economics have been reviewed and found to be reasonable and well documented. The lighting measures identified and savings are reasonable given our understanding of County goals. ARC Alternatives was able to replicate the savings estimates and costs shown in the OBF loan agreement based on a detailed audit and follow-up provided by EcoGreen. The only minor finding was that a few retrofits appear to be slightly aggressive in wattage reduction and may result in reduced light levels. For these retrofits, it is recommended to pay particular attention to the resulting light levels and ensure they are satisfactory. These areas may warrant 'mock-ups' to ensure acceptability before completing the remainder of the same fixtures, to ensure a smooth project implementation. See below for further discussion.

Specific Technical Considerations

Scope

The LED lighting scope of work appears to appropriately target a cost-effective approach balanced by quality, accounting for the existing fixture types. The general approach consists of UL Type B (lamp with integrated driver) tube LED (TLED) replacing interior fluorescent lamps and Philips EVO troffer retrofit kits retrofitting recessed troffer fixtures. There are tradeoffs between approaches on the TLED and retrofit kits, UL Type B (lamp with integrated driver) or C (lamp with external driver) are generally considered superior from a technology standpoint and are cost effective replacements in a lamp for lamp retrofit, without changing the fixtures. Where there are suspended ceilings and a predominance of recessed troffer fixtures, the troffer retrofit kits like the Philips EVO essentially replace the troffer lens while keeping the body of the fixture. These are equally well regarded from a technology standpoint, are good retrofits to economically utilize existing troffer fixtures while creating an aesthetically clean look.

Savings

The proposed measures, fixture wattages and hours of operation were all reviewed and found to be reasonable. Existing fixtures looked typical for the spaces, and the assumed wattages used industry standard wattages to calculate baseline demand. EcoGreen provided manufacturer's data sheets ("cutsheets") for proposed material, noting they had been updated in the last few months. A spot check of the most common fixtures found wattages used in the calculation matched the proposed materials. All fixtures and lamps are listed on the Design Lights Consortium (DLC) Qualified Product List (QPL), which is a requirement of the OBF program. Additionally, EcoGreen acknowledged that if a product were to become de-listed, they would substitute a qualifying product of equal or lesser wattage to maintain savings and OBF eligibility. This coincidentally, was why the cutsheets had been updated recently.

We also reviewed the hours of operation and resulting energy savings. The audit and energy savings calculation uses hours of operation for each line corresponding to an area. These hours vary appropriately from 365 hours/year in various restrooms and storage areas to 8,760 hours/year in some hallways and egress areas. The overall resulting 5,128 average operating hours per year are comparable to an industry standard reference Database for Energy Efficient Resources (DEER) which cites the average as 5,193 hours/year for medical and clinical areas. ARC was able to use the provided hours of operation and fixture wattages to calculate the baseline and proposed energy use, replicating the energy savings of 1,041,654 kWh/year stated by EcoGreen. The average utility rate of $0.166/kWh is used, which is reasonable and validated by the OBF loan agreement, which is the average calculated by PG&E for the 12 months prior to the loan agreement. Since rates have escalated since the loan agreement was approved, the resulting bill savings of $172,939 per year and simple payback of 5.78 years is slightly conservative. One note for housekeeping purposes; there was a difference of approximately two one-hundredths of a percent between the total savings in the audit material provided by EcoGreen and the approved PG&E figures which could be attributed to rounding or a minor

correction made by during the OBF. The OBF figures are what are presented in this memo, and the difference is negligible.

Measure Life

The rated life of the majority (~97%) of the new LED lamps and fixtures are rated for 50,000 to 70,000 hours, with a small portion rated at 15,000 hours. On balance, the weighted average lamp life is approximately 56,400 hours, which would yield an effective useful life (EUL) of 11 years based on the operating hours used for savings calculations. In addition to the long lamp life providing a maintenance benefit, the EUL exceeds the simple payback of the project, meaning that the retrofits are expected to produce a lifetime net benefit.

Light Levels

As mentioned above, the only minor finding was that during the course of the review a few fixture retrofit combinations appear to have aggressive wattage reductions that might result in reduced light levels. There are many factors that go into the actual light levels produced, including configuration of the space, existing fixture condition, color temperature of light source and the possibility that the space is currently overlit. Since any of these factors, or others, may be in play and nearly impossible to definitively provide an opinion on in the scope of this review, it is recommended that the County and EcoGreen work closely together to ensure adequate light levels are achieved. This approach was discussed with EcoGreen and they provided assurance that they would ensure all light levels were adequate. For the smoothness of the project, mock-ups may be considered to ensure the proposed solutions are adequate before proceeding with the rest.

The specific fixture combinations noted are listed below in Table 1, and details by location are in Table 2. As a way of bounding the potential impact, if a different solution had to be implemented to maintain higher light levels in all of the affected fixtures, ARC estimates the overall impact to the project savings would be less than 5%. It would also be reconciled with the OBF loan closeout, and the payback of the project and resulting loan terms would be updated to remain bill neutral. It should also be noted, that because of the same factors there may be other areas where light levels could be less than anticipated and not identified here; in essence, this review is not meant to be a comprehensive design review for every fixture and field observations will be the best test.

Table 1: Retrofit Combinations, Possible Light Level Reductions

Existing Fixture	Proposed Retrofit
~70W MH	LED A19, 4100K, 120v, w/ Socket Replacement
~100W MH/HPS	LED A21, 5000K, 277v
2x2 w3 utubes	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC
2x4 w4 t8	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC

Table 2: Location Details by Fixture Combination, Possible Light Level Reductions

Audit Line #	Existing	Watts/ Fix	# of Fixtures	Building/Zone	Room/Area	Suggested Replacement	Watts/Fix
684	lowbay flood w1 mh	95 w	6	Bldg 500 2nd floor. Labor and delivery	NICU main room 1	LED A19, 4100K, 120v, w/ Socket Replacement	15 w
687	lowbay flood w1 mh	95 w	6	Bldg 500 2nd floor. Labor and delivery	NICU main room 2	LED A19, 4100K, 120v, w/ Socket Replacement	15 w
691	lowbay flood w1 mh	95 w	2	Bldg 500 2nd floor. Labor and delivery	NICU main room 3	LED A19, 4100K, 120v, w/ Socket Replacement	15 w
696	lowbay flood w1 mh	95 w	1	Bldg 500 2nd floor. Labor and delivery	NICU sterilized room	LED A19, 4100K, 120v, w/ Socket Replacement	15 w
275	wp low to ground w1 mh	128 w	7	helipad	exterior	LED A21, 5000K, 277v	16 w
594	wp w1 hps	138 w	17	bldg 400.	exterior	LED A21, 5000K, 277v	16 w
367	2x2 w3 utubes	115 w	15	2nd floor of 200	Hallway behind surgery room 1 an 2	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC	16 w
337	2x2 w3 utubes	115 w	9	2nd floor of 200	Hallway	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC	16 w
922	2x2 w3 u tubes	89 w	22	Building 580	laboratory	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC	16 w
925	2x2 w3 u tubes	89 w	8	Building 580	micro biology	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC	16 w
1047	2x2 w3 utubes	89 w	15		Hallway behind surgery room 1 an 2	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC	16 w
1017	2x2 w3 utubes	89 w	9	2nd floor of 200	Hallway	LED Troffer 2x2,Retrofit Kit 4000K, UNV, REC	16 w
171	2x4 w4 t8	112 w	1	Bldg 300.	Natividad Foundation breakroom	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1096	2x4 w4 t8	112 w	9		Endo 2	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1098	2x4 w4 t8	112 w	9		Endo 1	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
280	2x4 w4 t8	112 w	1	820	restroom	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
281	2x4 w4 t8	112 w	1	820	locked office	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
321	2x4 w4 t8	112 w	1	200	exam room 10	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
322	2x4 w4 t8	112 w	1	200	exam room 11	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
323	2x4 w4 t8	112 w	1	200	exam room 9	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
324	2x4 w4 t8	112 w	1	200	exam room 8	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
326	2x4 w4 t8	112 w	1	200	exam room 7	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
327	2x4 w4 t8	112 w	1	200	exam room 6	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
328	2x4 w4 t8	112 w	1	200	exam room 5	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
329	2x4 w4 t8	112 w	1	200	exam room 4	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
330	2x4 w4 t8	112 w	1	200	exam room 3	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
331	2x4 w4 t8	112 w	1	200	exam room 2	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
332	2x4 w4 t8	112 w	2	200	exam room 1	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
349	2x4 w4 t8	112 w	8	2nd floor of 200	Surgery room 4	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
351	2x4 w4 t8	112 w	8	2nd floor of 200	Room 5	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
362	2x4 w4 t8	112 w	8	2nd floor of 200	Surgery room 1	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
363	2x4 w4 t8	112 w	8	2nd floor of 200	Surgery room 2	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
364	2x4 w4 t8	112 w	8	2nd floor of 200	Surgery room 3	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
400	2x4 w4 t8	112 w	2	2nd floor of 200	A&D 8	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
411	2x4 w4 t8	112 w	2	2nd floor of 200	A&D 9	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
413	2x4 w4 t8	112 w	2	2nd floor of 200	A&D 10	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
416	2x4 w4 t8	112 w	9	2nd floor of 200	Endo 2	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
418	2x4 w4 t8	112 w	9	2nd floor of 200	Endo 1	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
463	2x4 w4 t8	112 w	2	2nd floor of 200	Cast room	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1080	2x4 w4 t8	112 w	2		A&D 8	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1091	2x4 w4 t8	112 w	2		A&D 9	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1093	2x4 w4 t8	112 w	2		A&D 10	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1143	2x4 w4 t8	112 w	2		Cast room	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1001	2x4 w4 t8	112 w	1	2nd floor of 580	speexh therapy room	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1006	2x4 w4 t8	112 w	1	2nd floor of 580	speexh therapy room	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1029	2x4 w4 t8	112 w	8		Surgery room 4	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1031	2x4 w4 t8	112 w	8		Room 5	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1042	2x4 w4 t8	112 w	8		Surgery room 1	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1043	2x4 w4 t8	112 w	8		Surgery room 2	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w
1044	2x4 w4 t8	112 w	8		Surgery room 3	LED Troffer 2x4 Retrofit Kit, 4000K, UNV, REC	21 w

Other Measures

There is a very small amount of savings (approximately 0.7%) attributed to refrigeration coolers and freezers. While the detailed calculations and scope were not reviewed in this effort, the savings appear reasonable and approved by the OBF program, so no exceptions are taken.

Project Costs

Project costs were also reviewed and found to be reasonable, especially considering the medical environment which often adds cost. While it does not appear to be as expensive as the project would be if it fell under OSHPOD, it appears reasonably priced. Individual unit material costs were shared with ARC, and were found to be reasonable, along with the associated installation labor.

Conclusion

Overall, the project is well documented and reasonable as proposed, and the savings shown in the OBF loan agreement are validated. Careful consideration should be given to light levels in a minority of fixtures, but the rest of the considerations including scope, price and savings would not be adversely affected. The County and NMC can move forward with this project with confidence.